Missouri Department of Natural Resources

Summary of Design Guidance for Facilities with a Design Flow of 22,500 gpd or Greater

Water Protection Program fact sheet 9/2011

This document provides engineering consultants a comprehensive guide of the Missouri Department of Natural Resources' recommendations and requirements for a summary of design for facilities with a design flow of 22,500 gallons per day, or gpd, or greater.

Until 10 CSR 20-8.020 can be amended, 10 CSR 20-8.110 shall apply to all facilities with a design flow of 22,500 gpd or greater. 10 CSR 20-8.110 shall apply to all facilities with a design flow of 100,000 gpd or greater after 10 CSR 20-8.020 is amended.

A summary of design shall accompany the plans and specifications when applying for a construction permit per 10 CSR 20-8.110(5).

The following is a sample format for the required summary of design content:

Hydraulic and Organic Loadings
For consistency, use the following flow definitions as a basis for the design of sewers, pumping stations, wastewater treatment facilities, treatment units and other wastewater handling facilities. See 10 CSR 20-8.110(4)(C)4.A.

- **Design average flow** – The design average flow is the average of the daily volumes to be received for a continuous 12 month period expressed as a volume per unit time. However, the design average flow for facilities having critical seasonal high hydraulic loading periods (e.g., recreational areas, campuses and industrial facilities) shall be based on the daily average flow during the seasonal period.
- **Design maximum daily flow** – The design maximum daily flow is the largest volume of flow to be received during a continuous 24 hour period expressed as a volume per unit time.
- **Design peak hourly flow** – The design peak hourly flow is the largest volume of flow to be received during a one hour period expressed as a volume per unit time.
- **Design peak instantaneous flow** – The design peak instantaneous flow is the instantaneous maximum flow rate to be received.

For consistency, use the following organic load definitions as a basis for the design of wastewater treatment facilities. See 10 CSR 20-8.110(4)(C)5.A.

- **Biochemical Oxygen Demand** – The five day Biochemical Oxygen Demand, or BOD_5, is defined as the amount of oxygen required to stabilize biodegradable organic matter under aerobic conditions within a five day period.
- **Design average BOD_5** – The design average BOD_5 is generally the average of the organic load received for a continuous 12 month period for the design year expressed as weight per day. However, the design average BOD_5 for facilities having critical seasonal high loading periods (e.g., recreational areas, campuses and industrial facilities) shall be based on the daily average BOD_5 during the seasonal period.

- **Design maximum daily BOD_5** – The design maximum BOD_5 is the largest amount of organic load to be received during a continuous 24 hour period expressed as weight per day.
- **Design peak hourly BOD_5** – The design peak hourly BOD_5 is the largest amount of organic load to be received during a one hour period expressed as weight per day.

Per 10 CSR 20-8.110(4)(C)4.B, "projections shall be made from actual flow data to the extent possible. The data must be an accumulation of at least one year's worth of data." "Projections shall be made from actual wasteload data to the extent possible" per 10 CSR 20-8.110(4)(C)5.B.(I).

Provide the following flow and organic loading projections for sewer, pumping station and wastewater treatment facility projects. See 10 CSR 20-8.110(5)(A).

- Design average flow.
- Design peak hourly flow.
- Design peak instantaneous flow.
- Design average BOD_5.
- Design peak hourly BOD_5.
- Projected suspended solids.
- Impact from industrial sources (documented or assumed).
- Verification that downstream components (sewers, pumping stations and wastewater treatment facility units) have adequate capacity.

Process Units
Provide the following information for each process unit(s). See 10 CSR 20-8.110(5)(B).

- Unit dimensions.
- Flow rates and velocities.
- Detention times.
- Concentrations.
- Recycle rates.
- Chemical additive control.
- Physical control.
- Unit flexibility.
- Flow metering.
- Performance assumptions.
- Pump and system curves.

Diagrams
Supply process diagrams, flow diagrams with hydraulic capacities and any other applicable diagram(s). See 10 CSR 20-8.110(5)(C).

Design Calculations
Present any pertinent design calculations, tabulations, removal efficiency assumptions and deviations used to design the project. See 10 CSR 20-8.110(5)(E).

Provide the expected removal rates and effluent concentrations of all permit parameters from the Missouri State Operating Permit or Water Quality Antidegradation Review. Include separate tabulations for hydraulic, organic and biosolids calculations for each process unit as well as the wastewater treatment facility as a whole. See 10 CSR 20-8.110(5)(D).

Additional Information
Design information related to architectural, structural and mechanical components of a system do not need to be included. The department does not review architectural or structural designs. Sketches may be desirable to aid in the presentation of the project. Most criteria related to mechanical designs do not need to be presented unless addressed in 10 CSR 20-8.
See 10 CSR 20-8.110(5)(G).

Include any unusual specifications, construction materials and construction methods with explanations of their use in the project. Also include any maps, photographs and any other supporting data needed to describe the project in its entirety. See 10 CSR 20-8.110(5)(F).

Deviations
If this project contains known deviations from 10 CSR 20-8, submit the documentation and justification for the deviation with the summary of design, unless previously approved in the engineering report or facility plan. Note that many deviations are common while others are reviewed on a case-by-case basis. For innovative or new technology, the review process will be as stated in 10 CSR 20-8.140(5)(B).

For More Information

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